

THE LIFE HISTORY OF *PHILÆMATOMYIA INSIGNIS*, AUSTEN

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It is not a little remarkable that, although only two years have elapsed since Mr. Austen described *Philæatomyia insignis* as a new genus and new species, the fly has already been found to be widely distributed throughout the East. It has been recorded from most parts of India, from Ceylon, from Cyprus and also from Central Africa and Socotra. Moreover, a new species, *lineata*, has been described by Brunetti (placed, erroneously, as we believe, in a new genus *Pristirhynchomyia*), and we ourselves will shortly describe another species from Madras, under the name of *Philæatomyia gunnei*. It is extremely probable that the genus is a large and widely distributed one, which has escaped the attention of entomologists on account of its close resemblance to non-blood-sucking muscids. One of us (F.W.C.) will shortly describe the biting apparatus of *insignis*, and it will then be shown that, although the teeth are quite formidable weapons, they are so concealed by the pseudo-tracheal membrane that even in potash preparations a certain amount of dissection is required to expose them. In pinned specimens it is only exceptionally that one can see them.

These flies are of very considerable interest, on account of the well-defined position they occupy in the muscid group. Structurally, they are intermediate between *Stomoxys* and *Musca*, while as regards their habits, they are intermediate between the non-blood-sucking *Musca* (*M. domestica*, Lin., and *M. nebulosa*, Fabr.) and

such flies as *Musca pattoni*, Austen, and *Musca convexifrons*, Thomson, which have no piercing apparatus, and yet feed entirely on blood, sucking up that which exudes from the bites of *Tabanus*, *Chrysops*, *Haematopota* and *Philaetomyia*.

The breeding habits of this fly resemble in general those of non-blood-sucking muscids. The eggs, fifty to sixty in number, are laid in cow dung, the fly appearing to prefer small patches, freshly dropped, rather than larger collections of dried dung. On alighting, the female crawls over the surface until it finds a small crack or crevice; the ovipositor, which is similar to that of *Musca domestica*, is now thrust into the dung, the abdomen being depressed, and all the eggs are deposited in a heap, from $1/8$ to $1/4$ of an inch below the surface. The process takes from six to ten minutes.

When there are a large number of flies about, one often sees half a dozen or more all depositing their eggs in the same spot, their ovipositors being close to one another, while their heads are turned outwards. When the flies have finished laying their eggs an irregular heap of several hundreds will be found just beneath the surface. The eggs are laid from early morning until noon, rarely later.



FIG. 1.—Egg.

The egg (Fig. 1) measures from 2 to 2.2 mm. long by 0.4 mm. broad. It is of the usual muscid shape, an elongated ovoid, gently convex along one margin and concave on the other; one end is slightly more pointed than the other, but it has no spine. It is a yellowish white colour and densely opaque. On the concave margin there is a shallow groove, difficult to distinguish at the pointed end, but widening out towards the broader end of the egg.

The larvae hatch out, through the groove, in from eight to nine hours, that is, on the evening of the day on which the eggs were laid. When mature, they measure about 1.25 cm., their greatest

breadth being about one-seventh the length. They are cylindrical, pointed at the oral end, and are composed of twelve segments, of which the posterior seven are of approximately equal size. They are bright lemon yellow in colour, and on this account are readily distinguished from other muscid larvae. All the larvae remain together up to the evening of the second day, and then migrate,



FIG. 2.—Larva.

still in a company, from the dung, passing out from its under surface, and burrow in the ground, under leaves, etc., to pupate. This habit of migrating together is somewhat remarkable, and has not been observed in any other of the Muscids we have studied here.

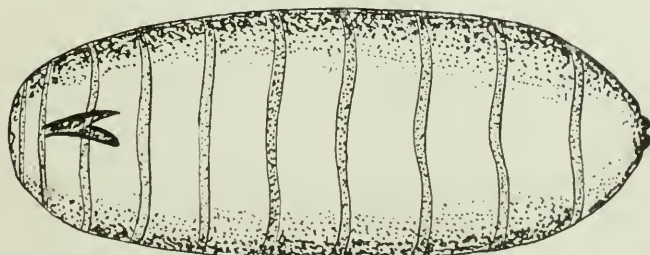


FIG. 3.—Pupa.

The *puparium* resembles that of *Musca*. It measures, on the average, 0.5 cm. long by 0.18 broad, though there is a considerable amount of variation in this respect. It is of a light mahogany colour, and eleven segments can be distinguished. At the posterior end there are two conspicuous kidney-shaped spiracles, raised somewhat above the surface; these have characteristic markings, as indicated in the figure, which are conspicuous on account of their orange colour, and which are distinctive of the species.

Breeding takes place in Madras throughout the year. The total time occupied is from six to seven days, varying a little according to the temperature. The large size of the egg and the short time in which it hatches suggest that the eggs undergo some development before they are laid.

About eight hours after hatching the fly is ready to feed. Both sexes suck blood, which forms their main if not their only food, though we have seen them rubbing their proboscides on the surface of cow dung when about to lay their eggs, in a manner which strongly suggests that they suck up the juices from the surface, possibly using their teeth to penetrate the crust.

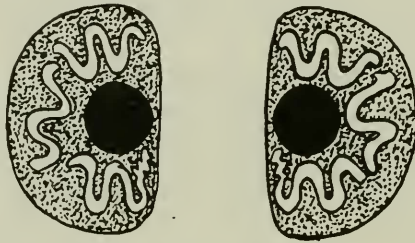


FIG. 4.—Posterior Spiracles.

They feed almost exclusively on cattle and, as far as we have observed, they only occasionally bite human beings. They do not ordinarily exhibit any preference for any particular part of the skin of the host, though we have found them especially attached to the abdomen of calves which have been shaved for vaccination. When feeding, the fly lies closely pressed against the skin of the host, its body being parallel with the surface. They remain until fully gorged, and are not easily disturbed; they can, in fact, be easily picked off with the fingers. Like most blood-suckers, they pass out a clear watery fluid, and later apparently unaltered blood, from the anus as the abdomen distends.

From the somewhat lethargic habit of the fly, and from the fact that it breeds rapidly and (in Madras) throughout the year, one would expect to find that it has natural enemies, which keep down its numbers. The chief of these is a small Hymenopteron (not yet identified). The habit of this wasp is to settle on the dung and to

watch for a fly laying its eggs. Having marked a victim, it crawls up to within an inch or two of it and then makes a short rapid flight, settles on the fly, and after stinging it through the head carries it away, holding it by means of its sting and its hind legs. We have seen as many as five of these wasps on the same patch of dung. The fly, busily engaged in laying its eggs, usually falls a ready victim to its extremely active enemy; should it escape the first assault, and fly away, the wasp will follow it and either catch it as it settles on a blade of grass, or later when it returns to the dung. The wasp also frequently attacks flies while feeding on cattle. Unfortunately, the wasp is so small and flies so rapidly that we have been unable to follow it to its nest.

Several small species of spider also prey on *Philaematomyia*, catching them while laying their eggs. There is also a small Asilid which has the same habit, and can often be seen to swoop down on a fly and carry it off, grasped in its forelegs, to a neighbouring twig, where it sucks out its juices.

Lastly, we have for several years observed a small *Tachinid*, which rests on a blade of grass close to a piece of dung in which *Philaematomyia* is laying its eggs. Its behaviour is very remarkable and suggestive. It sits with its head directed towards the fly, and every now and then darts towards it, in a very direct and business-like manner, and at once returns to its perch. It certainly does not catch, or attempt to catch, the fly. We have dissected specimens of this Tachinid caught in the act, and have found that its ovaries contain well-developed larvae, enclosed in thin transparent membranes, through which one can see the larva making active butting movements, as if in the endeavour to free itself. The fly, like most of the members of that family, deposits larvae and not eggs, and we suspect that the presence of this Tachinid is associated with that of the Hymenopteron mentioned above, and that the Tachinid deposits its larva on the *Philaematomyia* with the intention that it shall be carried to the nest of the wasp, where it would find ample food. We hope in time to settle this interesting biological problem.

The simplest way of breeding *Philaematomyia insignis* is to watch for a number of flies laying their eggs, and then to scoop up the whole patch of dung and place it in a long tin tray about

two to four inches deep. The dung should be placed at one end of the tray and a quantity of sand at the other. The larvae, when about to pupate, will migrate to the sand, from which the pupae can be removed to a closed vessel.

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